

ABSTRACT

An apparatus for generating seismic body waves in a hydrocarbon reservoir includes a closed-loop borehole source having a resonant cavity for generating resonant energy, a drive source and a control unit. The drive source injects pressure pulses to the resonant cavity at a predetermined or selectable pressure and frequency. The fluid circulates between the cavity and the drive source in a closed-loop fashion. In another embodiment, the borehole source utilizes a smart or controllable material that is responsive to an applied excitation field. The cavity includes an excitation coil for providing an excitation field that changes a material property of the smart fluid. The control unit is programmed to adjust operating parameters to produce seismic waves having a selected frequency and amplitude. In one embodiment, a control unit adjusts operating parameters in response to measured parameters of interest or surface commands.